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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/168,770	10/08/1998	RASHMI K. SHAH	TH-1042(US)	2851

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DEL S CHRISTENSEN
SHELL OIL COMPANY
INTELLECTUAL PROPERTY
P O BOX 2463
HOUSTON, TX 772522463

EXAMINER	
RIDLEY, BASIA ANNA	

ART UNIT	PAPER NUMBER
1764	20

DATE MAILED: 05/17/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/168,770	SHAH ET AL.	
	Examiner BR	Art Unit	
	Basia Ridley	1764	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 March 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15* is/are pending in the application.

4a) Of the above claim(s) *8-12* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7 and 13-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 October 1998* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Response to Amendment

1. The amendment filed on 16 November 1998 as Preliminary Amendment is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: all five chemical equations which applicant inserted into the specification.

The applicant argues that said equations are known in the art, as shown by USP 5,255,742, and therefore they are not new matter. This is not found persuasive. While said equations are, in fact, known in the art, their incorporation into instant application is considered a new matter because they were not included in the disclosure as originally filed. While USP 5,225,742 was mentioned in the disclosure as originally filed (see P3/L14-15), it was only relied upon to show that flameless oxidation as a source of heat is known in the art, and not to incorporate by reference said chemical equations.

Specification

2. The disclosure is objected to because the specification contains duplicate reference to parent application (on P1/L2-3 of disclosure as originally filed and before line 1 as entered by preliminary amendment filed on 16 November 1998).

Deletion of one of said references is required. Applicant is reminded that no new matter shall be added.

3. The disclosure is objected to because of following informalities, e.g.:

recitation: "The carbon dioxide and the carbon monoxide remain in equilibrium at elevated temperatures according to the shift gas reaction: $CO + H_2O + C \leftrightarrow CO_2 + H_2$ (5)" is not clear because said equation does not represent the shift gas reaction;

inconsistent numbering of elements: "combustion chamber 6" (P11/L11) and "combustion chamber 1" (throughout specification);

inconsistent numbering of elements: "oxidation chamber 2" (P11/L29) and "oxidation chamber 1" (throughout specification); and

inconsistent numbering of elements: "oxidation chamber 8" (P12/L1) and "oxidation chamber 1" (throughout specification).

Appropriate correction is required. Applicant is reminded that no new matter shall be added.

Drawings

4. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: "15" as shown in Fig. 1. A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Objections

5. Claim(s) 2-3 and 16-17 is/are objected to because of the following informalities:

claim(s) 1 recite(s) "the flowpath", line(s) 6, suggested correction is --the flow path--;

claim(s) 1 recite(s) "heat exchange relationship to the oxidation chamber", line(s) 12, suggested correction is --heat exchange relationship with the oxidation chamber--;

claim(s) 1 recite(s) "fluid noxxles", line(s) 16, suggested correction is --fluid nozzles--;

- claim(s) 2 recite(s) "system in fluid communication with (...)", suggested correction is -- system being in fluid communication with (...)--.

Appropriate correction is required. Applicant is reminded that no new matter shall be added.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claim(s) 1-7 and 13-15 is/are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 1 recitation "with each nozzle along the flowpath between the inlet and the outlet" is not clear.

In claim 1 recitation "a preheater in communication with the oxidation chamber inlet" is not clear. What kind of communication is meant?

Claim(s) 1 recite(s) the limitation(s) "the temperature" (line 8), "the combined oxidant and fuel" (line 8 and 10), "the fuel nozzle closest to (...)" (lines 9 and 10), "the autoignition temperature" (lines 9-10 and 14-15), "the heat" (line 13), "the temperature" (line 13), "the mixture" (line 13-14), "the vicinity" (lines 14 and 15), "the combined mixture" (line 15) and "that fuel nozzle" (line 15). There is insufficient antecedent basis for said limitation(s) in the claim(s).

Claim(s) 2 recite(s) the limitation(s) "the coke inhibitor system" and "the fuel supply conduit". There is insufficient antecedent basis for said limitation(s) in the claim(s).

Regarding claim 2, the phrase "can be" renders the claim indefinite because it is unclear whether the limitation(s) following the phrase are part of the claimed invention. See MPEP § 2173.05(d).

Claim(s) 3-4 recite(s) the limitation(s) "the oxidation reaction chamber". There is insufficient antecedent basis for said limitation(s) in the claim(s).

Claim(s) 5 recite(s) the limitation(s) "the production of olefins". There is insufficient antecedent basis for said limitation(s) in the claim(s).

In claim 6 recitation "process chamber is effective as (...)" is not clear.

Claim(s) 13-15 recite(s) the limitation(s) "the process". There is insufficient antecedent basis for said limitation(s) in the claim(s).

In claim 14-15 recitation "process is a (...) heater" is not clear.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claim(s) 1-7 and 13-15 is/are rejected under 35 U.S.C. 102(b) as being anticipated by Ruhl (EP 0 450 872).

Regarding claim(s) 1, Ruhl, in Fig. 4, disclose(s) a process heater comprising:

- an oxidation chamber (30) having an inlet (40) for oxidant , an outlet (54) for combustion products and a flow path (Fig. 4) between the inlet (40) and the outlet (54);

- a fuel conduit (60) capable of transporting a fuel mixture to a plurality of fuel nozzles (64) within the oxidation chamber (30), each nozzle (64) providing communication from within the fuel conduit (60) to the oxidation chamber (30), with each nozzle (64) along the flow path between the inlet (40) and the outlet (54);
- a preheater in communication with the oxidation chamber inlet (P5/L41-46), the preheater capable of increasing the temperature of the oxidant to a temperature resulting in the combined oxidant and fuel from the fuel nozzle closest to the oxidation chamber inlet being hotter than the autoignition temperature of the combined oxidant and fuel from the fuel nozzle closet to the oxidation chamber inlet (P5/L51-57); and
- a process chamber (20) in a heat exchange relationship to the oxidation chamber (Fig. 4), wherein the heat transferred from the oxidation chamber does not cause the temperature of the mixture within the oxidation chamber in the vicinity of each fuel nozzle to decrease below the autoignition temperature of the combined mixture in the oxidation chamber in the vicinity of that fuel nozzle (P5/L51-57), and the fuel nozzles (64) are capable of distributing fuel into the oxidation chamber (30) without forming a flame (Fig. 4).

Regarding claim(s) 2-6 and 13, Ruhl disclose(s) all of the claim limitations as set forth above. Additionally the reference discloses a heater further comprising:

- a coke inhibitor injection system in fluid communication with the fuel conduit wherein an amount of coke inhibitor supplied can be effective to inhibit coke formation at fuel conduit operating temperatures (P5/L8-10); wherein
- the fuel conduit is a tubular conduit essentially centrally located within the oxidation reaction chamber (Fig. 4);

- the oxidation reaction chamber is essentially centrally located within the process chamber (Fig. 4);

- the process chamber is a pyrolysis chamber for production of olefins (P3/L3-21);

- the process chamber is effective as a steam methane reforming reaction chamber (P3/L3-21); and

- the process comprises an endothermic chemical reaction (P3/L3-210).

Regarding claim(s) 5-7 and 13-14 it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex parte Masham*, 2 USPQ2d 1647 (1987).

Instant claim(s) 1-7 and 13-15 structurally read(s) on heater of Ruhl.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. Claim(s) 1-7 and 13-15 is/are rejected under 35 U.S.C. 103(a) as being unpatentable over Ruhl (EP 0 450 872) in view of Mikus (USP 5,255,742).

Regarding claim(s) 1, Ruhl, in Fig. 1, disclose(s) a process heater comprising:

- an oxidation chamber (30) having an inlet (40) for oxidant , an outlet (54) for combustion products and a flow path (Fig. 1) between the inlet (40) and the outlet (54);

- a fuel conduit (34) capable of transporting a fuel mixture to a fuel nozzle (Fig. 1) within the oxidation chamber (30), said nozzle providing communication from within the fuel conduit (34) to the oxidation chamber (30);
- a preheater in communication with the oxidation chamber inlet (P5/L41-46); and
- a process chamber (20) in a heat exchange relationship to the oxidation chamber (30).

While Ruhl shows embodiments of his heater which operate without a flame (see Fig. 4), such operation is not disclosed with respect to Fig. 1.

Mikus, in Fig. 3, teaches a process heater comprising:

- an oxidation chamber (10) having an inlet for oxidant , an outlet for combustion products and a flow path between the inlet and the outlet (Fig. 3);
- a fuel conduit (12) capable of transporting a fuel mixture to a plurality of fuel nozzles (13) within the oxidation chamber (10), each nozzle (13) providing communication from within the fuel conduit (12) to the oxidation chamber (10), with each nozzle (13) along the flow path between the inlet and the outlet; and
- a preheater in communication with the oxidation chamber inlet, the preheater capable of increasing the temperature of the oxidant to a temperature resulting in the combined oxidant and fuel from the fuel nozzle closest to the oxidation chamber inlet being hotter than the autoignition temperature of the combined oxidant and fuel from the fuel nozzle closet to the oxidation chamber inlet (C3/L25-30).

In said process heater preheating at least the air stream and then mixing the fuel gas into the combustion air in relatively small increments will result in the flameless combustion (C4/27-40). The absence of flame eliminates the flame as a radiant heat source and results in more even

temperature distribution throughout the length of the burner (abstract). Further it eliminates the hot spots within the burner and structures surrounding the burner, which originate from the radiant heat transfer from the luminous portion of the flame. Said process heater not only optimizes the process operation but it is also less expensive than a process heater operating with flames because of less expensive materials of construction (C2/L4-12).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the heater in the apparatus of Ruhl with the heater of Mikus for the purpose of providing more even temperature distribution throughout the length of the burner and lowering the costs of said apparatus.

Regarding claim(s) 2-4, Ruhl in view of Mikus disclose(s) all of the claim limitations as set forth above. Additionally Mikus discloses a heater further comprising:

- a coke inhibitor injection system in fluid communication with the fuel conduit wherein an amount of coke inhibitor supplied can be effective to inhibit coke formation at fuel conduit operating temperatures (C6/L25-35); wherein
- the fuel conduit is a tubular conduit essentially centrally located within the oxidation reaction chamber (Fig. 3); and
- the oxidation reaction chamber is essentially centrally located within the process chamber (Fig. 3).

Regarding claim(s) 5-6 and 13, Ruhl in view of Mikus disclose(s) all of the claim limitations as set forth above. Additionally Ruhl discloses a heater further comprising:

- the process chamber is a pyrolysis chamber for production of olefins (P3/L3-21);

- the process chamber is effective as a steam methane reforming reaction chamber (P3/L3-21); and
- the process comprises an endothermic chemical reaction (P3/L3-210).

Regarding claim(s) 5-7 and 13-14 it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex parte Masham*, 2 USPQ2d 1647 (1987).

Response to Arguments

12. Applicant's arguments filed on 6 March 2002 have been fully considered but they are not persuasive.

13. The applicant argues that the instant claims should be interpreted, under 35 U.S.C. 112, sixth paragraph, as functionally defining recited apparatus and that said interpretation requires that nozzles used to distribute the fuel into the oxidation chamber are sized and oriented as specified in the instant disclosure to accomplish flameless combustion. Therefore, while Ruhl discloses a reactor that looks similar to the reactor of the present invention, it does not teach the sizing and placement of nozzles which results in flameless combustion.

This is not found persuasive. The examiner would like to point out that MPEP§2181 sets forth that: "Applicants and reexamination patentees before the PTO have an opportunity and obligation to specify, consistent with these guidelines, when a claim limitation invokes 35 U.S.C 112, sixth paragraph", therefore placing the burden of precise claim drafting on the applicant. The guidelines are divided into 3-prong analysis:

(A) the claim limitation must use the phrase "means for" or "step for";

(B) the "means for" or "step for" must be modified by functional language; and

(C) the phrase "means for" or "step for" must not be modified by structure, material or acts for achieving the specified function.

In the instant case claim 1 does not include the phrase "means for" or "step for". Further, the implied functional language of said claim "capable of distributing the fuel into the oxidation chamber without forming a flame" (emphasis added) is not sufficient to invoke 35 U.S.C. 112, sixth paragraph, as such recitation does not require that fuel distribution is performed without forming a flame, but only requires that recited apparatus is able to perform said fuel distribution without forming a flame. Therefore said claim was not interpreted as invoking 35 U.S.C. 112, sixth paragraph.

This being the case, the examiner notes that both references used to teach the process heater as recited in rejected claims (specifically, Ruhl in Fig. 4 and Mikus in Fig. 3) do, in fact, teach nozzles for distributing the fuel into the oxidation chamber without forming a flame, as described in the instant specification and as interpreted by one of ordinary skill in the art (see instant specification pages 5-7 and 10-11 and grounds of rejection set forth in this Office action). The instant specification does not disclose specific size and orientation of nozzles which may be required for fuel distribution without forming a flame.

14. Upon further reconsideration, applicant's arguments and affidavit under 37 C.F.R. 1.132 filed on 7 March 2001 are found not persuasive.

The arguments and affidavit cite numerous advantages of the flameless combustor of the instant invention apparent when said combustor is used as a process heater in various specific processes, and they state that said advantages would have not been obvious to one of ordinary

skill in the art. In response the examiner would like to point out that the fact that applicant has recognized another advantage or advantages which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985).

Conclusion

15. In view of the foregoing, none of the claims are allowed.

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Basia Ridley, whose telephone number is (703) 305-5418. The examiner can normally be reached on Monday through Thursday, from 8:30 AM to 7:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Marian Knode, can be reached on (703) 308-4311.

The fax phone number for Group 1700 is (703) 872-9311 (for Official papers after Final), (703) 872-9310 (for other Official papers) and (703) 305-6078 (for Unofficial papers). When filing a fax in Group 1700, please indicate in the Header (upper right) "Official" for papers that are to be entered into the file, and "Unofficial" for draft documents and other communication with the PTO that are not for entry into the file of the application. This will expedite processing of your papers.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0661.

Basia Ridley BR
Examiner
Art Unit 1764

BR
May 11, 2002

Marian C Knode

MARIAN C. KNODE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700